

## AMENDMENTS TO THE CLAIMS

**Claims 1, 3-5, 9, 11-15, 17-31, 33-39, 41-45, 47-50, 52-54** are pending.

**Claims 2, 16, 32, 46, and 51** were previously canceled.

**Claims 6-8, 10, and 40** are canceled herein.

**Claims 1, 4, 9, 13-15, 17-24, 27-30, 31, 34, 36-39, 43-45, 48, and 50** are currently amended.

The following listing of claims replaces all prior versions and listings of claims in the application.

1. **(Currently Amended)** A computer-implemented method comprising:  
executing computer-readable instructions with a processor that, when executed,  
direct a computing device to perform the acts of:  
  
~~converting, by a computing device, extracting metadata from the text of an~~  
unstructured service requests log of ~~comprising information that is a result of an~~ end-user  
and product support engineer ~~product~~ communications, wherein the metadata comprise at  
least one of a product name, a symptom, a cause, a resolution, a problem diagnosis  
question, or a link to a product support article; ~~processes, which is not based on~~  
~~information solely generated by a professional writer or a vendor tasked with~~  
~~documenting a product,~~  
  
aligning at least one of the product name, the symptom, the cause, the resolution,  
the problem diagnosis question, or the link to the product support article from the  
metadata to form ~~to~~ one or more structured answer objects, wherein one structured

~~answer object is formed from one unstructured service request log; each unstructured service request including information to narrow product problem symptom(s) to a root cause; each structured answer object comprising hierarchically structured historic problem diagnosis data; and~~

~~in view of the product problem symptom(s):~~

~~clustering the one or more structured answer objects into semantic clusters, wherein the semantic clusters are reinforced by cross referencing the one or more structured answer objects based a link feature to a same product support article, the link feature arranged in a separate layer than a content of the one or more structured answer objects and the cross referencing creating an inter-layer link between the one or more structured answer objects and the same product support article;~~

~~identifying a set of the one or more structured answer data objects based on the semantic clusters, wherein each structured answer object in the set comprises at least one of a term or a phrase; each structured answer data object in the set comprising term\_(s) and/or phrase(s)-related to the product problem a symptom[[(s)]] description; and~~

~~providing historic and hierarchically structured problem diagnosis data from the set of the one or more structured answer objects to an the end-user, for product problem diagnosis, a wherein the problem diagnosis data comprising: comprises a one or more symptom description data fields, a one or more cause description data fields, and a one or more resolution description data fields organized into a hierarchical tree structure such that~~

~~a product problem description;~~

~~a product problem cause that caused a described product problem; and~~

~~a product problem resolution that resolves the described product problem by fixing a corresponding product problem cause, wherein a product problem each symptom description data field is a parent node of a product problem a one or more of the cause description data fields, and the product problem each cause description data field is a parent node of the product problem a one or more resolution description data fields.~~

**2. (Canceled)**

**3. (Original)** The method of claim 1, and wherein the problem diagnosis data comprise a link to a product support article.

**4. (Currently Amended)** The method of claim 1, and wherein converting the unstructured service requests, identifying the set, and providing the historic and hierarchically structured problem diagnosis data are performed by a server computing device, and wherein the method further comprises:

receiving, from a client computing device, the ~~product problem~~ symptom description; and

wherein providing the historic and hierarchically structured problem diagnosis data further comprises:

searching ~~an~~ the index for terms and/or phrases that match term(s) in the ~~product problem~~ symptom description to identify the one or more structured answer objects corresponding to the symptom description in the set; and

communicating the ~~set~~ identified one or more structured answer objects to the client computing device for display by a troubleshooting wizard to the ~~end~~-user.

**5. (Previously Presented)** The method of claim 1, wherein the method further comprises dynamically generating a knowledge base article from information provided by the set.

**6. (Canceled)**

**7. (Canceled)**

**8. (Canceled)**

**9. (Currently Amended)** A method at least partially implemented by a computing device comprising:

executing computer-readable instructions with a processor that, when executed, direct a computing device to perform the acts of:

communicating, by a troubleshooting wizard, a search request comprising a product problem description of a problem with a product generated from an input by a user of the troubleshooting wizard to a server computing device, wherein the input comprises a text-based symptom description and identification of the product;

receiving a response from the server computing device; and

~~responsive to receiving the search request, systematically presenting to a user of the troubleshooting wizard historical product problem diagnosis data organized by the server computing device into a hierarchical tree from structured answer data objects in view of the product problem description;~~

responsive to receiving a the response to the search request, presenting, by the troubleshooting wizard, the information from the response to the user, wherein the information comprises symptoms, causes, and resolutions from the unstructured service requests log of end-user and product support engineer communications and the information is organized into a hierarchical tree structure such that a symptom description data field is a parent node of a one or more cause description data fields, and each cause description data field is a parent node of a one or more resolution description data fields, wherein the text-based symptom description and identification of a product provided by the user correspond to the symptom description data field.~~historic problem diagnosis data, the historic problem diagnosis data comprising information that is a result of an end-user and product support engineer product communication processes, which is not based on information solely generated by a professional writer or a vendor tasked with documenting a product.~~

**10. (Canceled)**

**11. (Previously Presented)** The method of claim 9, wherein the information comprises a link to a product support article.

**12. (Previously Presented)** The method of claim 9, wherein the information comprises a set of structured answer objects.

**13. (Currently Amended)** The method of claim 12, wherein respective ones of the structured answer objects are clustered by the server computing device as corresponding to one another, the clustering being based on:

obtaining clustering information from separate types of objects that are arranged in separate layers, wherein each separate layer comprises a homogenous type of objects;  
and

iteratively projecting and propagating the clustering information until the clustering converges. ~~reinforced clustering operations.~~

**14. (Currently Amended)** The method of claim 13, wherein the clustering is further based on unified clustering operations, wherein the unified clustering operations provide additional clustering analysis generated by a human being.

**15. (Currently Amended)** A computer-readable storage medium comprising computer-executable instructions for:

converting, by a computing device, unstructured service requests log of an end-user and a product support engineer communications to one or more structured answer objects, wherein each unstructured service request comprises ~~comprising information that is a result of an end-user and product support engineer product communication processes and including information to narrow~~ product problem information, product problem

cause information, and product problem resolution information and symptom(s) to a root cause, each structured answer object corresponds to a single unstructured service request and the structured answer object represents the product problem information, the product problem cause information, and the product problem resolution information in a one-problem-one-cause-one-solution structure; comprising hierarchically structured historic problem diagnosis data; and

receiving, from a client computing device, a product problem description;

in view of the product problem symptom(s);

identifying a set of the one or more structured answer data objects, each structured answer data object in the set comprising term(s) and/or phrase(s) terms and phrases related to the product problem description; symptom(s); and

generating semantic clusters from the set of structured answer objects based on content and link features of the structured answer objects by using a two-ways k-means mutual reinforcement clustering algorithm to iteratively cluster each structured answer object to a lower dimensional feature space, wherein the semantic clusters represent product problem information, product problem cause information, and product problem resolution information from a plurality of unstructured service requests logs in a hierarchical one-problem-to-multiple-cause-multiple-solution structure; and

providing historic and hierarchically structured problem diagnosis data from the set to an end-user for product problem diagnosis, the problem diagnosis data comprising the product problem cause information, and the product problem resolution information from the semantic clusters to an end-user for product problem diagnosis.;

a product problem description;

~~a product problem cause that caused the described product problem; and~~  
~~a product problem resolution that resolves the described product problem~~  
~~by fixing the corresponding product problem cause, wherein a product problem~~  
~~description data field is a parent node of a product problem cause data field, and~~  
~~the product problem cause data field is a parent node of the product problem~~  
~~resolution data field.~~

**16. (Canceled)**

**17. (Currently Amended)** The computer-readable storage medium of claim 15, and wherein the problem diagnosis data comprise a link to a product support article.

**18. (Currently Amended)** The computer-readable storage medium of claim 15, ~~and wherein converting the unstructured service requests, identifying the set, and providing the historic and hierarchically structured problem diagnosis data are performed by a server computing device, and wherein the computer executable instruction further comprise instructions for:~~

~~receiving, from a client computing device, the product problem description; and~~  
~~wherein providing the historic and hierarchical, structured problem diagnosis~~  
data further comprises:

~~searching an index for terms and/or phrases that match term(s) in the product~~  
~~problem description to identify the one or more structured answer objects in the set;~~



communicating the set to the client computing device for display by a troubleshooting wizard to the end-user.

**19. (Currently Amended)** The computer-readable storage medium of claim 15, wherein the computer-executable instruction further comprise instructions for dynamically generating a knowledge base article from information provided by the set.

**20. (Currently Amended)** The computer-readable storage medium of claim 15, wherein after converting the unstructured service requests and before identifying the set ~~and providing the historic and hierarchically structured problem diagnosis data~~, the computer-executable instruction further comprise instructions for:

generating an index by:

extracting features from the structured answer objects;

analyzing the features to identify the ~~terms~~ terms and the phrases;

assigning relevance weight to the terms and the phrases;

normalizing terminology within the terms and the phrases; and

wherein identifying the set is based on information in the index.

**21. (Currently Amended)** The computer-readable storage medium of claim 20, wherein after converting the unstructured service requests and before identifying the set ~~and providing the historic and hierarchically structured problem diagnosis data~~, the computer-executable instruction further comprise instructions for:

clustering respective ones of the structured answer objects based on the index to group related structured answer objects; and

wherein providing the set, the set comprises a reinforced cluster of structured answer objects, reinforced by cross referencing the one or more structured answer objects that include an inter-layer link to a same product support article.

**22. (Currently Amended)** The computer-readable storage medium of claim 21, wherein clustering comprises:

obtaining clustering information from separate types of objects that are arranged in separate layers, wherein each separate layer comprises a homogenous type of objects;

iteratively projecting and propagating the clustering information until the clustering converges; reinforced and

unifying the clustering by providing additional clustering analysis generated by a human being-unified clustering operations.

**23. (Currently Amended)** A computer-readable storage medium comprising computer-executable instructions executable on a computing device for:

communicating, by a troubleshooting wizard, a search request comprising a product problem description of a problem with a product generated from an input by a user of the troubleshooting wizard to a server computing device, wherein the input comprises a text-based symptom description and identification of the product; and

receiving a response from the server computing device, the response comprising information obtained from a full-text search of an unstructured service requests log of end-user and product support engineer communications; and

responsive to receiving a the response to the search request, presenting, by the troubleshooting wizard, the information from the response to the user, ~~wherein the information is derived from end user and product support engineer product communication processes, and which is not based on information solely generated by a professional writer or vendor tasked with documenting a product problem, and wherein~~ the information comprises symptoms, causes, and resolutions from the unstructured service requests log of end-user and product support engineer communications and the information is organized into a hierarchical tree structure such that a symptom description data field is a parent node of a one or more cause description data fields, and each cause description data field is a parent node of a one or more resolution description data fields, wherein the text-based symptom description and identification of a product provided by the user correspond to the symptom description data field.:

~~a product problem description;~~

~~a product problem cause that caused a described product problem; and~~

~~a product problem resolution that resolves the described product problem by fixing a corresponding product problem cause, wherein a product problem description data field is a parent node of a product problem cause data field, and the product problem cause data field is a parent node of the product problem resolution data field.~~

**24. (Currently Amended)** The computer-readable storage medium of claim 23, wherein the ~~historic problem diagnosis data~~ information comprises any one or more of hierarchically structured product problem description, symptom, cause, and resolution information.

**25. (Previously Presented)** The computer-readable storage medium of claim 23, wherein the information comprises a link to a product support article.

**26. (Previously Presented)** The computer-readable storage medium of claim 23, wherein the information comprises a set of structured answer objects.

**27. (Currently Amended)** The computer-readable storage medium of claim 26, wherein respective ones of the structured answer objects were clustered by the server computing device as corresponding to one-another, the clustering being based on:

obtaining clustering information from separate types of objects that are arranged in separate layers, wherein each separate layer comprises a homogenous type of objects;  
and

iteratively projecting and propagating the clustering information until the clustering converges. ~~reinforced clustering operations.~~

**28. (Currently Amended)** The computer-readable storage medium of claim 27, wherein the clustering is further based on unified clustering operations, wherein the

unified clustering operations provide additional clustering analysis generated by a human being.

**29. (Currently Amended)** A computer-readable storage medium comprising a structured answer object data structure for use in product problem analysis and diagnosis, the structured answer object data structure comprising:

a product problem description data field;

a product problem cause data field; and

a product problem resolution data field; ~~and~~

wherein data fields are organized into a hierarchical tree structure such that the product problem description data field is a parent node of a one or more of the product problem cause data fields, and each product problem cause data field is a parent node of a one or more of the product problem resolution data fields. ~~wherein the product problem description data field is a parent node of the product problem cause data field, and the product problem cause data field is a parent node of the product problem resolution data field.~~

**30. (Previously Presented)** The computer-readable storage medium of claim 29, wherein the structured answer object data structure further comprises a product problem symptom data field, the product problem description field being a parent node of the product problem symptom data field.

**31. (Currently Amended)** A computing device comprising:

a processor; and

a memory coupled to the processor, the memory comprising computer-program instructions executable by the processor for:

converting, by a computing device, unstructured service requests log of end-user and a product support engineer communications to one or more structured answer objects, wherein each unstructured service request comprises product problem information, product problem cause information, and product problem resolution information and ~~that is a result of an end user and product support engineer product communication processes, which is not based on information solely generated by a professional writer or vendor tasked with documenting a product, and includes information to narrow product problem symptom(s) to a root cause;~~ each structured answer object corresponds to a single unstructured service request and the structured answer object represents the product problem information, the product problem cause information, and the product problem resolution information in a one-problem-one-cause-one-solution structure; ~~comprising hierarchically structured historic problem diagnosis data; and~~

receiving, from a client computing device, a product problem description;

~~in view of the product problem symptom(s);~~

identifying a set of the ~~one or more~~ structured answer ~~data~~ objects, each structured answer ~~data~~ object in the set comprising ~~term(s) and/or phrase(s)~~ terms and phrases related to the product problem description-symptom(s); and

generating semantic clusters from the set of structured answer objects based on content and link features of the structured answer objects by using a two-ways k-means

mutual reinforcement clustering algorithm to iteratively cluster each structured answer object to a lower dimensional feature space, wherein the semantic clusters represent product problem information, product problem cause information, and product problem resolution information from a plurality of unstructured service requests logs in a hierarchical one-problem-to-multiple-cause-multiple-solution structure; and

providing historic and hierarchically structured problem diagnosis data from the set to an end-user for product problem diagnosis, the problem diagnosis data comprising the product problem cause information, and the product problem resolution information from the semantic clusters to an end-user for product problem diagnosis.;

~~a product problem description;~~

~~a product problem cause that caused the described product problem; and~~

~~a product problem resolution that resolves the described product problem by fixing the corresponding product problem cause, wherein a product problem description data field is a parent node of a product problem cause data field, and the product problem cause data field is a parent node of the product problem resolution data field.~~

**32. (Canceled)**

**33. (Previously Presented)** The computing device of claim 31, and wherein the problem diagnosis data comprise a link to a product support article.

**34. (Currently Amended)** The computing device of claim 31, ~~and wherein converting the unstructured service requests, identifying the set, and providing the historic and hierarchically structured problem diagnosis data are performed by a server computing device, and wherein the computer-executable instruction further comprise instructions for:~~

~~receiving, from a client computing device, the product problem description; and~~  
wherein providing the ~~historic and hierarchically structured~~ product problem diagnosis data further comprises:

searching an index for terms and/or phrases that match ~~term(s)~~ terms and phrases in the product problem description to identify the one or more structured answer objects in the set; and

communicating the set to the client computing device for display by a troubleshooting wizard to the end-user.

**35. (Previously Presented)** The computing device of claim 31, wherein the computer-executable instruction further comprise instructions for dynamically generating a knowledge base article from information provided by the set.

**36. (Currently Amended)** The computing device of claim 31, wherein after converting the unstructured service requests and before identifying the set ~~and providing the historic and hierarchically structured problem diagnosis data~~, the computer-executable instruction further comprise instructions for:

generating an index by:



extracting features from the structured answer objects;  
analyzing the features to identify the terms and the phrases;  
assigning relevance weight to the terms and the phrases;  
normalizing terminology within the terms and the phrases; and  
wherein identifying the set is based on information in the index.

**37. (Currently Amended)** The computing device of claim 36, wherein after converting the unstructured service requests and before identifying the set ~~and providing the historic and hierarchically structured problem diagnosis data~~, the computer-executable instruction further comprise instructions for:

clustering respective ones of the structured answer objects based on the index to group related structured answer objects; and

wherein providing the set, the set comprises a reinforced cluster of structured answer objects, reinforced by cross referencing the one or more structured answer objects that include an inter-layer link to a same product support article.

**38. (Currently Amended)** The computing device of claim 37, wherein clustering comprises:

obtaining clustering information from separate types of objects that are arranged in separate layers, wherein each separate layer comprises a homogenous type of objects;

iteratively projecting and propagating the clustering information until the clustering converges; and

unifying the clustering by providing additional clustering analysis generated by a human being. ~~reinforced and unified clustering operations.~~

**39. (Currently Amended)** A computing device comprising:

a processor; and

a memory coupled to the processor, the memory comprising computer-program instructions executable by the processor for:

communicating, by a troubleshooting wizard, a search request comprising a product problem description of a problem with a product generated from an input by a user of the troubleshooting wizard to a server computing device, wherein the input comprises a text-based symptom description and identification of the product;

receiving a response from the server computing device, the response comprising information obtained from an unstructured service requests log of end-user and product support engineer communications; and

~~responsive to receiving a response to the search request, systematically presenting to a user of the troubleshooting wizard historical product problem diagnosis data organized by the server computing device into a hierarchical tree from structured answer data objects in view of the product problem description; and~~

responsive to receiving ~~a~~ the response to the search request, presenting, by the troubleshooting wizard, the information from the response to the user, the information comprising symptoms, causes, and resolutions from the unstructured service requests log of end-user and product support engineer communications and the information is organized into a hierarchical tree structure such that a symptom description data field is a

parent node of a one or more cause description data fields, and each cause description data field is a parent node of a one or more resolution description data fields, wherein the text-based symptom description and identification of a product provided by the user correspond to the symptom description data field. ~~historic problem diagnosis data, the historic problem diagnosis data comprising information that is a result of an end-user and product support engineer product communication processes, which is not based on information solely generated by a professional writer or vendor tasked with documenting a product.~~

**40. (Canceled)**

**41. (Previously Presented)** The computing device of claim 39, wherein the information comprises a link to a product support article.

**42. (Previously Presented)** The computing device of claim 39, wherein the information comprises a set of structured answer objects.

**43. (Currently Amended)** The computing device of claim 42, wherein respective ones of the structured answer objects were clustered by the server computing device as corresponding to one-another, the clustering being based on;

obtaining clustering information from separate types of objects that are arranged in separate layers, wherein each separate layer comprises a homogenous type of objects;  
and

iteratively projecting and propagating the clustering information until the clustering converges. ~~reinforced clustering operations.~~

**44. (Currently Amended)** The computing device of claim 43, wherein the clustering is further based on unified clustering operations, wherein the unified clustering operations provide additional clustering analysis generated by a human being.

**45. (Currently Amended)** A computing device comprising:

means for processing;

means for storing computer-program instructions executable by the processing

means, wherein the instructions, when executed enable:

means for converting unstructured service requests~~comprising information that is a result log of an end-user and product support engineer product communications processes, which is not based on information solely generated by a professional writer or vendor tasked with documenting a product,~~ to one or more structured answer objects, wherein each unstructured service request including comprises product problem information, product problem cause information, and product problem resolution information and ~~to narrow product problem symptom(s) to a root cause,~~ each structured answer object corresponds to a single unstructured service request and the structured answer object represents the product problem information, the product problem cause information, and the product problem resolution information in a one-problem-one-cause-one-solution structure;~~comprising hierarchically structured historic problem diagnosis data; and~~

means for receiving, from a client computing device, a product problem description;

means for identifying a set of ~~the one or more~~ structured answer data objects, each structured answer data object in the set comprising ~~term(s) and/or phrase(s)~~ terms and phrases related to the product problem description; and

means for generating semantic clusters from the set of structured answer objects based on content and link features of the structured answer objects by using a two-ways k-means mutual reinforcement clustering algorithm to iteratively cluster each structured answer object to a lower dimensional feature space, wherein the semantic clusters represent product problem information, product problem cause information, and product problem resolution information from a plurality of unstructured service requests logs in a hierarchical one-problem-to-multiple-cause-multiple-solution structure; and

means for providing ~~historic and hierarchically~~ product problem diagnosis data comprising the product problem cause information, and the product problem resolution information from the semantic clusters ~~structured problem diagnosis data from the set to~~ an end-user for product problem diagnosis, ~~the problem diagnosis data comprising:~~

~~a product problem description;~~

~~a product problem cause that caused the described product problem; and~~

~~a product problem resolution that resolves the described product problem by fixing the corresponding product problem cause, wherein a product problem description data field is a parent node of a product problem cause data field, and the product problem cause data field is a parent node of the product problem resolution data field.~~

**46. (Canceled)**

**47. (Previously Presented)** The computing device of claim 45, and wherein the problem diagnosis data comprise a link to a product support article.

**48. (Currently Amended)** The computing device of claim 45, ~~and further comprising:~~

~~means for receiving, from a client computing device, the product problem description; and~~

wherein the means for providing the ~~historic and hierarchically structured~~ product problem diagnosis data further comprises:

means for searching an index for terms and/or phrases that match ~~term(s)~~ terms and phrases in the product problem description to identify the one or more structured answer objects in the set; and

means for communicating the set to the client computing device for display by a troubleshooting wizard to the end-user.

**49. (Previously Presented)** The computing device of claim 45, further comprising means for dynamically generating a knowledge base article from information provided by the set.

**50. (Currently Amended)** A computing device comprising:

means for processing;

means for storing computer-program instructions executable by the ~~processor~~;

processing means, wherein the instructions when executed enable:

~~means for communicating a search request to a server computing device, the~~  
~~means enabling a user to communicate~~ comprising a product problem description of a  
problem with a product generated from an input by a user of the computing device to a  
server device, wherein the input comprises a text-based symptom description and  
identification of the product;

means for receiving a response from the server computing device, the response  
comprising information obtained from an unstructured service requests log of end-user  
and product support engineer communications; and

~~responsive to receiving a~~ the response to the search request, means for presenting  
the information from the response to the user, the information comprising symptoms,  
causes, and resolutions from the unstructured service requests log of end-user and  
product support engineer communications and the information is organized into a  
hierarchical tree structure such that a symptom description data field is a parent node of a  
one or more cause description data fields, and each cause description data field is a parent  
node of a one or more resolution description data fields, wherein the text-based symptom  
description and identification of a product provided by the user correspond to the  
symptom description data field. ~~hierarchically structured historic problem cause and~~  
~~resolution data, the historic problem cause and resolution data being associated with~~  
~~term(s) and/or phrase(s) related to the product problem description, wherein the product~~

~~problem description is the parent of the corresponding historic problem cause data, and the historic problem cause data are parents of the corresponding historic problem resolution data.~~

**51. (Canceled)**

**52. (Previously Presented)** The computing device of claim 50, wherein the information comprises a link to a product support article.

**53. (Previously Presented)** The computing device of claim 50, wherein the information comprises a set of structured answer objects.

**54. (Previously Presented)** The computing device of claim 53, wherein respective ones of the structured answer objects were clustered by the server computing device as corresponding to one another.